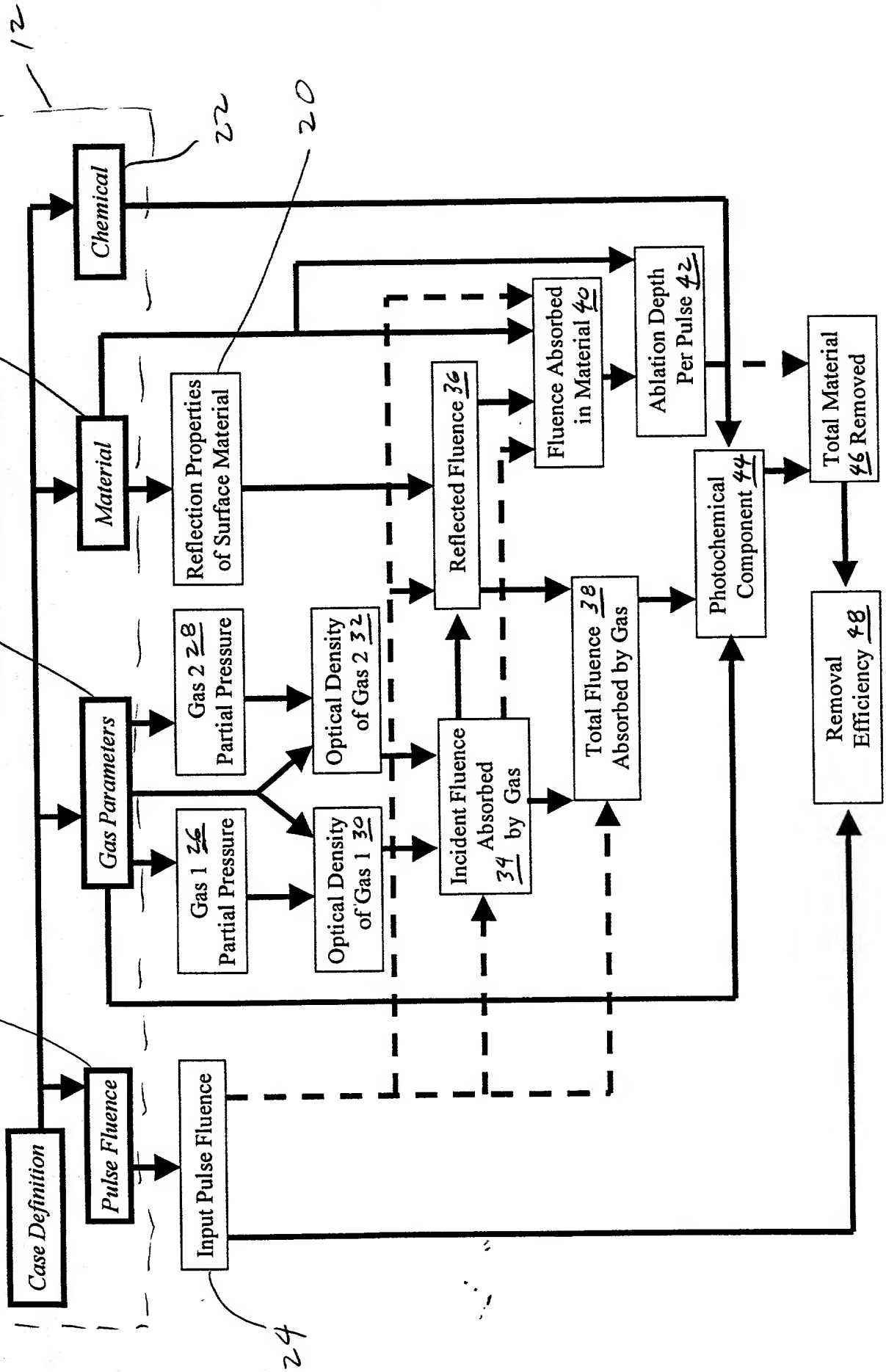

12
22
20
18
16
14
24
Case Definition
Pulse Fluence
Input Pulse Fluence
Gas Parameters
Gas 1 26 Partial Pressure
Gas 2 28 Partial Pressure
Material
Chemical
Reflection Properties of Surface Material
Optical Density of Gas 1 30
Optical Density of Gas 2 32
Incident Fluence Absorbed 34 by Gas
Reflected Fluence 36
Total Fluence 38 Absorbed by Gas
Fluence Absorbed in Material 40
Ablation Depth Per Pulse 42
Photochemical Component 44
Total Material 46 Removed
Removal Efficiency 48

FIG. 1

54 56 58

UVTech Systems Inc., PhotoChemical Ablation Model

Case Definition

Removed Material	AZ 2400 Photo Resist
Reactive Gases	Ozone + Oxygen
Laser Wavelength (nm)	193 / 248 / 266 / 355

Pulse Fluence

Base Fluence Value (mJ/cm2)	1
Fluence Increment (mJ/cm2)	30

Gas Parameters

Reactive Gases	Starting Partial Pressure (Torr)	Partial Pressure Increment (Torr)	Molecular Cross Section (x 10-20 cm)
Gas 1 (Ozone)	1	0	67.50
	1	0	810.00
	1	0	762.75
	1	0	0.07
Gas 2 (Oxygen)	499	0	0.00675
	499	0	0.0000675
	499	0	0
	499	0	0
other	0	0	0
	0	0	0
	0	0	0
	0	0	0
Total Pressure	500		
	500		
	500		
	500		
Optical Path Through Gas (cm)	3		

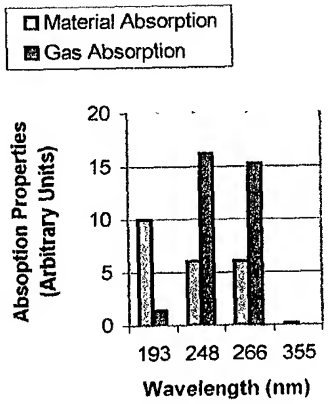
Material Parameters

Material Absorption Coefficient (micron-1)	10	
	1.73	
	1.73	
	0.148	
Material Threshold (mJ/cm2)	5.19	
	30	
	30	
	350.68	
Material Refractive Index	2.10	
	1.90	
	1.86	
	1.74	
Angle of Incidence (Degrees)	0.1	
Reflectivity Amplitude (s & p)	0.31	0.31
	0.30	0.30
	0.27	0.27
Reflectivity Component (s & p)	0.13	0.13
	0.10	0.10
	0.09	0.09
	0.07	0.07
Total Reflectivity	0.13	
	0.10	
	0.09	
	0.07	

Chemical

Photo-chemical parameter 1	0.002
Photo-chemical parameter 2	0.02

Spectral Dependencies



1,0 1,2 60 62

FIG. 2

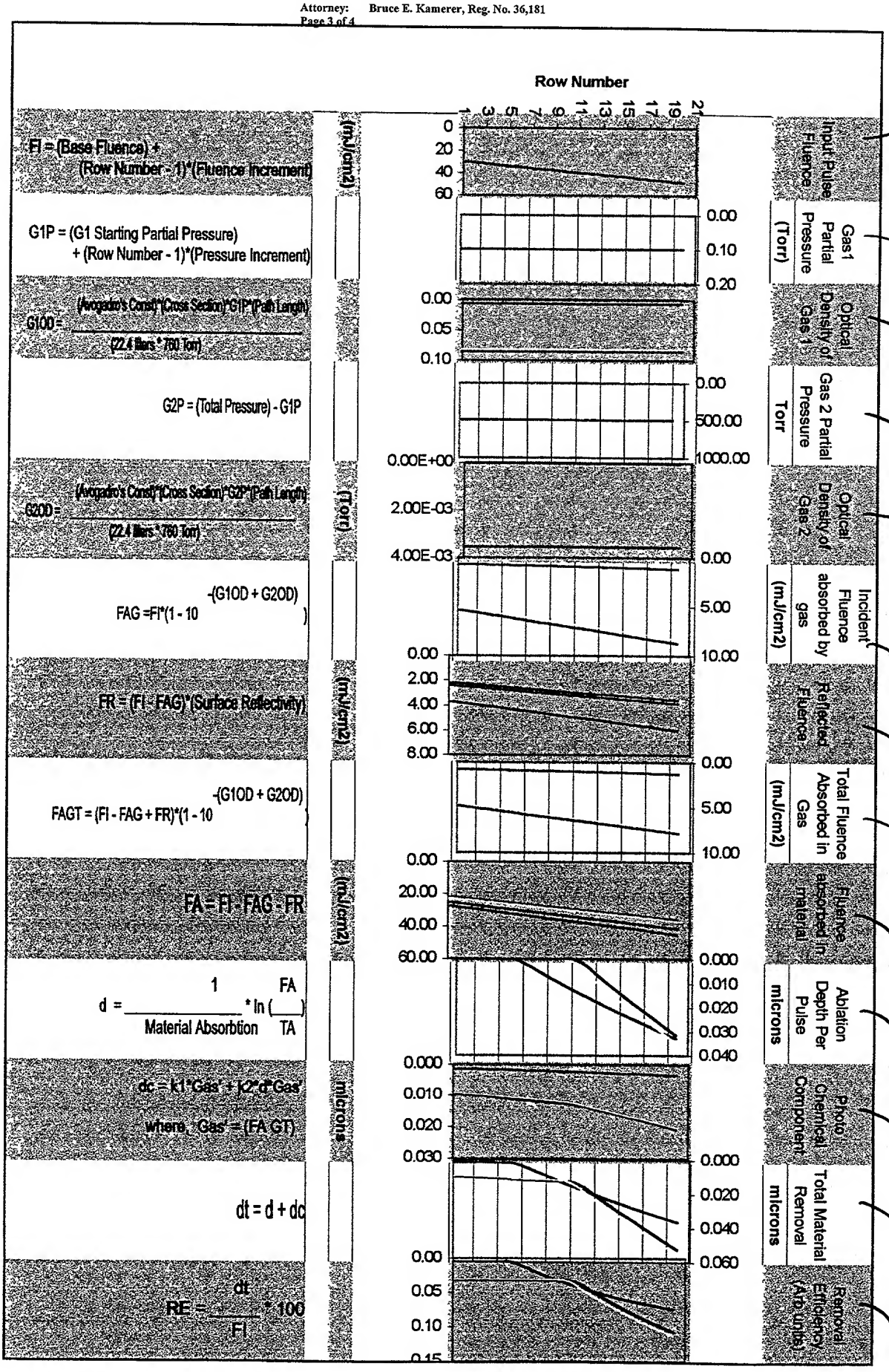

Row Number
Fl = (Base Fluence) + (Row Number - 1)*(Fluence Increment)
G1P = (G1 Starting Partial Pressure) + (Row Number - 1)*(Pressure Increment)
G1OD = (Avogadro's Const)*(Cross Section)*G1P*(Path Length) / (22.4 liters * 760 Torr)
G2P = (Total Pressure) - G1P
G2OD = (Avogadro's Const)*(Cross Section)*G2P*(Path Length) / (22.4 liters * 760 Torr)
FAG = Fl*(1 - 10^-(G1OD + G2OD))
FR = (Fl - FAG)*(Surface Reflectivity)
FAGT = (Fl - FAG + FR)*(1 - 10^-(G1OD + G2OD))
FA = Fl - FAG - FR
d = 1 / Material Absorbtion * ln(FA / TA)
dc = k1*'Gas' + k2*d*'Gas'
where, 'Gas' = (FA GT)
dt = d + dc
RE = dt / Fl * 100
(mJ/cm2)
(Torr)
(mJ/cm2)
(mJ/cm2)
(mJ/cm2)
microns
microns
Input Pulse Fluence
Gas1 Partial Pressure (Torr)
Optical Density of Gas 1
Gas 2 Partial Pressure Torr
Optical Density of Gas 2
Incident Fluence absorbed by gas (mJ/cm2)
Reflected Fluence
Total Fluence Absorbed in Gas (mJ/cm2)
Fluence absorbed in material
Ablation Depth Per Pulse microns
Photo Chemical Component
Total Material Removal microns
Removal Efficiency (Arb units)
24
26
28
30
32
34
36
38
40
42
44
46
48

FIG. 3

193 nm

Row Number	(mJ/cm2) Incident Fluence	(Torr) Gas1 Partial Pressure	Optical Density of Gas 1	(Torr) Gas 2 Partial Pressure	Optical Density of Gas 2	(mJ/cm2) Incident Fluence absorbed by gas	(mJ/cm2) [illegible]	(mJ/cm2) Total Fluence Absorbed in Gas	(mJ/cm2) [illegible]	microns Ablation Depth Per Pulse	microns [illegible]	microns Total Material Removal	Removal [illegible]
20	[illegible]	1.00	0.07	499.00	0.003573226	90.78	[illegible]	85.99	[illegible]	0.439	[illegible]	1.367	[illegible]
19	[illegible]	1.00	0.07	499.00	0.003573226	86.01	[illegible]	81.47	[illegible]	0.434	[illegible]	1.304	[illegible]
18	[illegible]	1.00	0.07	499.00	0.003573226	81.24	[illegible]	76.95	[illegible]	0.428	[illegible]	1.241	[illegible]
17	[illegible]	1.00	0.07	499.00	0.003573226	76.47	[illegible]	72.44	[illegible]	0.422	[illegible]	1.178	[illegible]
16	[illegible]	1.00	0.07	499.00	0.003573226	71.70	[illegible]	67.92	[illegible]	0.416	[illegible]	1.116	[illegible]
15	[illegible]	1.00	0.07	499.00	0.003573226	66.93	[illegible]	63.40	[illegible]	0.409	[illegible]	1.054	[illegible]
14	[illegible]	1.00	0.07	499.00	0.003573226	62.16	[illegible]	58.88	[illegible]	0.401	[illegible]	0.992	[illegible]
13	[illegible]	1.00	0.07	499.00	0.003573226	57.39	[illegible]	54.36	[illegible]	0.393	[illegible]	0.930	[illegible]
12	[illegible]	1.00	0.07	499.00	0.003573226	52.62	[illegible]	49.85	[illegible]	0.385	[illegible]	0.868	[illegible]
11	[illegible]	1.00	0.07	499.00	0.003573226	47.85	[illegible]	45.33	[illegible]	0.375	[illegible]	0.806	[illegible]
10	[illegible]	1.00	0.07	499.00	0.003573226	43.08	[illegible]	40.81	[illegible]	0.365	[illegible]	0.744	[illegible]
9	[illegible]	1.00	0.07	499.00	0.003573226	38.31	[illegible]	36.29	[illegible]	0.353	[illegible]	0.682	[illegible]
8	[illegible]	1.00	0.07	499.00	0.003573226	33.55	[illegible]	31.78	[illegible]	0.340	[illegible]	0.619	[illegible]
7	[illegible]	1.00	0.07	499.00	0.003573226	28.78	[illegible]	27.26	[illegible]	0.324	[illegible]	0.556	[illegible]
6	[illegible]	1.00	0.07	499.00	0.003573226	24.01	[illegible]	22.74	[illegible]	0.306	[illegible]	0.491	[illegible]
5	[illegible]	1.00	0.07	499.00	0.003573226	19.24	[illegible]	18.22	[illegible]	0.284	[illegible]	0.424	[illegible]
4	[illegible]	1.00	0.07	499.00	0.003573226	14.47	[illegible]	13.70	[illegible]	0.256	[illegible]	0.353	[illegible]
3	[illegible]	1.00	0.07	499.00	0.003573226	9.70	[illegible]	9.19	[illegible]	0.216	[illegible]	0.274	[illegible]
2	[illegible]	1.00	0.07	499.00	0.003573226	4.93	[illegible]	4.67	[illegible]	0.148	[illegible]	0.171	[illegible]
1	[illegible]	1.00	0.07	499.00	0.003573226	0 16	[illegible]	0.15	[illegible]	0.000	[illegible]	0.000	[illegible]

FIG. 4